but on the *Ctenophoræ*, a family well known to all students of pelagic animals. ANTON DOHRN

Naples, February 28

Faraday's "Experimental Researches"

IF your readers will compare Mr. Quaritch's letter in last week's NATURE with his advertisement of the two preceding weeks, they will see that it bears its condemnation on its own face. No words of mine can make it plainer than his do, that a *reprint* of an obsolete and valuable book was offered to the public as something not stated to be a reprint. Had that advertisement stated that the work was a "facsimile reprint," there could have been no ground either for complaint or for an indignation for which no apology is needed.

University College, Bristol SILVANUS P. THOMPSON

Mimicry in Birds

ON the evening of the 24th inst. my attention was attracted by an interesting example of mimicry in the case of the starling. The first thing which attracted my attention was hearing the cry of a blackbird in distress, and on looking round, the only bird to be seen was a solitary starling, which, when I first observed it, was uttering its own note; but almost immediately thereafter it began to whistle loudly in imitation of the blackbird. After this, for the space of about half an hour, it kept up a constant succession of notes in mimicry of the chaffinch and sparrow, always, however, using its own note for the space of about half a minute between each change. I may add that it did not seem to have any particular order in which it repeated the various notes.

A gentleman in this neighbourhood tells me that last year he observed a similar occurrence in his garden; but this, so far as I can learn, is the only other instance of similar mimicry in this quarter. Perhaps some of your readers may be able to inform me if it it is of common occurrence elsewhere.

Edinburgh, February 26 J. STUART THOMSON

Great Waterfalls

SEEING Mr. Guillemard's inquiry (vol. xvii. p. 221), I refer him for accounts of the Falls of Tequendama, which I visited in 1851, to "Viajes Cientificos a los Andes Ecuatoriales, &c.," por M. Boussingault, traducidas por J. Acosta; Paris, 1849, and "New Granada: Twenty Months in the Andes," by Prof. Isaac F. Hotton. (New York: Harper and Brothers, 1857.)

New York, February THOS. BLAND

SEVERAL NEW APPLICATIONS OF SCIENCE INTRODUCED INTO WAR

ON Saturday last, the Speaker of the House of Commons and a large following of members, visited the Portsmouth Dockyards, mainly for the purpose of witnessing some torpedo warfare; the *Inflexible* was also inspected. Near the starboard side of the ship, one of the sheds had been converted into a temporary lecture-room, and provided with numerous diagrams, a model of the ship, and a full-sized skeleton model of the 80-ton gun, 26 feet long, 6 feet broad at the breach, and having a calibre of 16 inches, with four of which it is intended to arm the turrets of the *Inflexible*. The diagrams were drawn on a scale of one-fourth of an inch, half an inch, and 6 inches (half-size) to the foot, and were designed with the object of enabling the visitors to draw a comparison between the structures of the *Dreadnought* and the *Inflexible*, and the respective thicknesses and disposition of their armour. As soon as the party had assembled around the drawings, Mr. W. B. Robinson, the Chief Constructor of the yard, stepped forward and delivered a brief illustrative lecture on the main points and differences of the two ships. He pointed out that while the length of the *Inflexible*—320 feet—was exactly the same as the *Dreadnought*, its beam—75 feet—was 11 feet 2 inches broader; that its volume of displacement was greater, its armour heavier, its turrets thicker, and its armament more formidable. While, however, the *Dreadnought* was armoured along the water-line, the citadel of the other ship, which was placed upon an armoured deck below, was the only protected portion of the *Inflexible* above the water. The arrangements of the turrets was also different; for whereas those of the smaller ship were placed along the middle line, the turrets of the larger were *échelonèd* to starboard and port in order that all the four guns might be trained upon an enemy either direct ahead or direct astern. The weather deck between the turrets had also been raised, so that the guns could be loaded from below without the necessity of depressing their muzzles. She was supplied with steam and hand pumps, and with Friedland's injectors, which would enable her to discharge 5,300 tons of water an hour. She had 133 water-tight compartments, and water would be admitted into the double bottom to reduce the rolling of the ship. Her torpedoes would be discharged from submerged ports in the bows instead of from above the water in the side, as in the *Thunderer*. The ventilating arrangements will be of the most perfect kind; for, as Mr. Robinson remarked, while in the other ships the fresh air is pumped into all parts, no means are adopted for assisting the vitiated atmosphere out of the ship. In the *Inflexible*, however, the ventilation comprises both supply and exhaust arrangements. The air is brought down into an air chamber, or cave of Æolus, in the central part of the citadel, and is driven thence by steam fans through large pipes, which pass under the armour deck and up into the structures above, and by means of branch pipes fitted with cocks every compartment in the ship can receive an abundant supply. By these cocks an officer can regulate his air supply in much the same way that a householder on shore can regulate his water supply. The vitiated air is sucked up through pipes with perforated ends into the funnels, and thence through the citadel into the open air. The *Inflexible* will be brig-rigged, but her masts will be unshipped before going into action. Her engines are of 8,000-horse power, and she is expected to attain a speed of 14 knots.

Runs of the 16-inch Whitehead torpedo were next made. One was fired from a steam pinnace as in actual warfare, its course, which was in a straight line for about 200 yards, being distinctly traceable by the exhaust air-bubbles which it threw up. The other was discharged from the surface of the water for the purpose of showing how readily it sank automatically to the required depth. The next novelty submitted was the steam pinnace, which, without having a single man on board, can do everything but stoke and keep its own fires alight. Its engines are worked and its movements are controlled wholly by electricity, the cable which supplies it with its mysterious power being unwound from winches as the pinnace sails on its mission, "And drags at each remove a lengthening chain." Its principal use is to drop and explode countermines in the neighbourhood of an enemy's mines, and by destroying them clear a harbour for the approach of the fleet. It performed its work to the amazement of the beholders on Saturday. The countermines were represented by a couple of barrels containing small charges of gun-cotton, and with these slung over the sides it took its departure from the boat containing the battery and dropped the casks at a distance of about 200 yards, igniting at the same time the fuses which blew the barrels into match-wood, and returned obediently, like a "thing of life," to the controlling hand after having accomplished its duty. Near at hand in the basin the torpedo nettings for protecting ships against the locomotive torpedo were exhibited on the sides of the *Actæon*, while the prow of the *Bloodhound*, gunboat, was armed with the trawl with which it is proposed to pick up sunken mines. The notes of the bugle were next heard as a summons to quarters and for the *Thunderer* to be cleared for action. In an

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incredibly short space of time the stanchions and guard-rails were flung down, the water-tight doors closed, and the couple of Gatling guns dismounted from their carriages on the superstructure deck and hoisted up to the tops, whence they could each discharge 200 shots per minute upon hostile boats. Presently the process of loading the guns was gone through, in the fore turret by hydraulic power, and in the after turret by hand gear; the turrets were rotated and the guns run out, and the snapping of the tube fuses told the spectators that a furious action had commenced.

The party was next conveyed to the *Vernon*, torpedo school, where Capt. Arthur and Commander Wilson had still more surprising wonders in the art of warfare for them to witness. First of all, Commander Wilson delivered a hurried lecture on the mysteries of torpedo science, explaining the differences between offensive and defensive torpedo warfare, the nature of the several explosive substances used, and the methods of firing torpedoes—mechanically, by means of glass tubes of sulphuric acid, which explode on coming in contact with chloride of potash, or glass tubes filled with potassium, which causes explosion on mixing with the water, or, electrically, by means of detonation produced by fulminate of mercury. Commander Wilson also showed by means of a model in a tank the method of ascertaining when a ship is over a sunken torpedo by means of cross-bearings, and how the mine is fired as soon as the telescope which is following the movements of the ship completes the electrical circuit. As the model, however, did not sink with great alacrity in its mimic ocean, Commander Wilson explained that the torpedo did not profess to destroy a ship instantly, but only to knock a hole in the bottom about the size of a barn door. At the conclusion of the lecture the company again went on deck, and saw discs of dry and damp gun-cotton harmlessly consumed, and how a solid block of wood could be shivered by the same material when exploded with a detonator. Next, on looking over the bulwarks, they beheld a practical illustration of the boat's crew "creeping" for an enemy's torpedo, the process consisting in dragging for the mooring chains, and, when found, destroying them by a discharge of gun-cotton. They were also shown the manner of attack with star torpedoes, firing lines of counter mines by "bumping" the circuit closer, and, lastly, how attacking boats can be destroyed by grenades fired by fuses held in the hand. These beautiful experiments closed the day's programme.

We are glad that so large a body of our legislators were present, and we are sure they could not fail to be impressed with the importance of science in its bearing on war. In fact it has become clear that the more war we have, or are likely to have, the more is science needed; and it would indeed be a very short-sighted policy for Government to cut down the very moderate supplies allowed to science for the purpose of providing war expenditure. We hope that after what they saw on Saturday the members of the House of Commons will have a higher opinion of the national value of scientific research than to adopt any such course.

METEOROLOGICAL NOTES

TORNADO IN CHESTER COUNTY, PENN., U.S.—Mr. Richard Darlington, of Ercildoun Seminary, has published an account of a remarkable tornado which swept over this portion of the United States on Sunday, July 1, 1877. The tornado appears to have been first felt a little to westward of the boundary line between Chester and Lancaster Counties, and to have thence run a course of twenty-two miles, first in a direction E. 20° S., then E. 15° S., and lastly, E. 7° S., moving bodily onwards at rates of from five to fifteen miles an hour, the average progressive movement being twelve miles an hour. The destruction of trees, houses, and other property is estimated at about 40,000 dols., the destruction being most complete in those cases where the tornado moved across a valley. An uninterrupted roar, like that of thunder, accompanied it during its whole course, which is sufficiently accounted for by the inherent energy of the tempest itself and the havoc it wrought throughout its course, such as twisting thick oak-trunks in two, tearing up tall trees by the roots, and whirling them aloft, and blowing down buildings and scattering their contents in all directions. The breadth of the tornado varied from 100 to 300 feet, the average being 200 feet, though the *débris* was scattered to a greater distance on either side. It appears to have originated between a south-west and a north-west wind, where a large dark cloud seemed to form in the atmosphere, suspended from which was a whitish funnel-shaped cloud whirling round in a terrible manner. The air was thick with the objects which were whirled aloft, the movements of which closely resembled buzzards sailing round. The rotary movement was to the left, and the cone appeared to be a cloud of vapour nearly white, connected at the upper end with a smooth surface of cloud somewhat darker. The upper portion of the cone appeared to move in a straight line and at a uniform rate, while the tail or lower end frequently bent in different directions, as if swayed from its true course by the hills and valleys it crossed. No rain fell in its track, but hailstones of a large size and in great quantity fell at intervals along its north side. Trees in the northern half of the track were generally thrown down with their tops to the south, while those on the southern side were thrown to the north; but at certain points, such as at Ercildoun, trees and other *débris* were thrown down in what appeared to be inextricable confusion. Some of the observers state that the *débris* ascended up the centre of the funnel-shaped cloud and fell back to the ground outside it, but the tornado was too sudden, brief, and appalling to admit of careful observations being made on this point, which is all-important in its bearing on the theory of tornadoes. No tornado is known previously to have traversed this part of the United States.

THE LAW AND ORIGIN OF THUNDERSTORMS.—In the Christmas issue of the *Bulletin International* of the Paris Observatory, there is an interesting note on this subject by Prof. Ch. V. Zenger, of Prague. He has examined the thunderstorms which occurred at Prague during the ten years ending 1849, and those at Vienna during the four years ending 1875, arranging the dates of their occurrence according to the semi-solar days each period of observation embraced, there being twenty-nine such semi-solar days in each year. The general result is that, dividing the semi-solar day into three equal portions, 47 per cent. of the whole thunderstorms occurred in one of these portions, 32 per cent. in another, while only 21 per cent. occurred in the third. Prof. Zenger is of opinion that this result points to a cosmical origin for the thunderstorm, operating, no doubt, on pre-existing terrestrial conditions, an opinion which receives some countenance from the relation subsisting between thunderstorms and auroral and magnetic perturbations. The subject is of sufficient importance to call for a wider and more exhaustive treatment.

MONTHLY METEOROLOGICAL BULLETIN OF THE MONTSOURIS OBSERVATORY, No. 69.—This number gives the observations for August last, which now include, for the first time, the hourly velocities of the wind in addition to the hourly temperatures and rainfall, which were added some months ago. The daily minimum velocity of the wind, 7·2 miles per hour, for August occurred about 6 A.M., and the maximum velocity, 13·1 miles per hour, about 2 P.M., the increase in the wind's velocity being thus nearly doubled between these hours. These hours are all but coincident with the hours of mean minimum and maximum temperature. The table of the hourly amounts of the rainfall is a peculiarly valuable one. Several years must, however, elapse before its full

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